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The Ferns of Washington

T. C. FRYE AND MABEL McMURRY JACKSON

INTRODUCTION

This work was begun in the fall of 1909, at the opening of Mrs. Jackson's senior year at the University of Washington. The drawings are original and the descriptions were checked with the plants. Nothing new is claimed for the work, but it is hoped that it will enable even those who know very little about botany to recognize the ferns of our State with certainty. The division of the labor was as follows:

MABEL McMURRY JACKSON—All drawings except one; the writing of the first draft of the keys and descriptions.

T. C. FRYE—Revision of the keys and descriptions; origin of generic names; uses of the plants.

S. M. ZELLER—The photographs.

BESS COWLEY—One drawing of *Adiantum*.

Material of several species was furnished by Mr. W. N. Suksdorf and Mr. John B. Flett.

T. C. F. & M. M. J.

Mar. 20, 1913.

PTERIDOPHYTES. FERN GROUP.

This group includes the True Ferns, Water Ferns, Adders-tongue, Grape-ferns, Horse-tails, Scouring Rushes, Club-mosses, Moss-ferns and Quillworts. They repro-

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duce by spores and are distinguished from other spore plants by having much more highly developed organs, such as stem, leafy sporophyte, roots (with few exceptions), and vessels for the conduction of water. They are distinguished from the flowering plants by the absence of seed.

KEY TO THE FAMILIES

- A. Plants rooted to the ground though sometimes submerged, often not moss-like, nearly always more than 1 in. long; leaves either not minute or else not 2-lobed.
 - B. Leaves not palmately 4-foliate, not clover-like.
 - C. Branches jointed, hollow (except in *Equisetum scirpoides*), elongated; leaves reduced to a sheath-like whorl of bracts at each joint. Equisetaceae (Horse-tail Family).
 - CC. Branches not jointed, solid, often not elongated or none; leaves not mere sheath-like whorls of bracts.
 - D. Plant a tuft of long grass-like leaves from a somewhat bulbous stem. Isoetaceae (Quillwort Family).
 - DD. Leaves not grass-like; stem often elongated.
 - E. Leaves $\frac{1}{2}$ in. or less long, entire or merely serrulate, sessile; plant resembling a large moss.
 - F. Spores all alike; leafy cylinder $\frac{1}{8}$ in. or more in diameter, if only $\frac{1}{8}$ in. wide with the stem beneath the surface of the ground. Lycopodiaceae (Club-moss Family).
 - FF. Spores of two kinds; leafy cylinder $\frac{3}{16}$ in. or less in diameter; stem prostrate. Selaginellaceae (Moss-fern Family).
 - EE. Leaves 1 or more inches long, lobed to compound (except entire in *Ophioglossum*), petioled; plant not moss-like.
 - G. Sporangia in a spike or panicle which is not green, but is apparently a branch of the leaf-stalk of an ordinary foliage leaf. Ophioglossaceae (Adder's-tongue Family).
 - GG. Sporangia on the ordinary green foliage leaves, or else on modified but wholly separate green leaves. Polypodiaceae (True Fern Family).
 - BB. Leaves palmately 4-foliate, much resembling a 4-leaved clover. Marsiliaceae (Clover-fern Family).
- AA. Plants free-floating or merely stranded, moss-like, $\frac{1}{4}$ -1 inch long; leaves minute, 2-lobed. Salviniaceae (Floating-fern Family).

LYCOPODIACEAE. CLUB-MOSS FAMILY.

Plants perennial, evergreen, somewhat moss-like, erect or creeping, terrestrial, very leafy; stems often elongated, usually freely dichotomously branched. Leaves arranged in 4 to many ranks, many, small, lanceolate, simple.

Spore-leaves at or near tips of branches, in some like the foliage leaves, in others different and forming cone-like spikes with or without pedicels. Sporangia all alike, solitary in or very near the axils of the spore-leaves, kidney-shaped, with thin tough walls; spores very abundant, all alike; thalli usually subterranean, with or without chlorophyll. There is only the following genus.

LYCOPODIUM. CLUB-MOSS.

Description the same as for the family. (Greek *lykos* = a wolf, *pous* = a foot; apparently suggested by the branched erect shoots of some species.) *L. clavatum*, *L. annotinum* and *L. inundatum* are made into wreaths and sold for Christmas decorations.

- A. Sporangia borne in axils of ordinary leaves; cones none; plant $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, very densely leafy.
 - B. Leaves curved upward; stems usually 6 in. or less high; upper and lower leaves sterile. 1. *L. selago*.
 - BB. Leaves spreading or reflexed; stems usually more than 6 in. high; sporangia borne all along the stem. 2. *L. lucidulum*.
- AA. Sporangia borne in axils of modified leaves which are grouped in special cones or spikes; plants either narrower or else leaves not extremely dense.
 - C. Branches flat; leaves in 4 ranks, adhering to the stem. 3. *L. complanatum*.
 - CC. Branches round; leaves in more than 4 ranks, not adhering to the stem except sometimes in *L. sitchense*.
 - D. Erect branches apparently in tufts from a horizontal stem; leafy branches $\frac{3}{16}$ in. or less wide. 4. *L. sitchense*.
 - DD. Erect branches not in tufts; leafy branches often wider.
 - E. Plant creeping with occasional erect branches, not at all tree-like in its form.
 - F. Cones more than 1, on a long branch with leaves far apart. 5. *L. clavatum*.
 - FF. Cones usually only 1, on an ordinary leafy branch.
 - G. Leaves spreading; branches 2-forked, long; cones usually less than 1 in. long. 6. *L. annotinum*.
 - GG. Leaves curved upwards; branches not distinctly 2-forked, not long; cones usually more than 1 in. long. 7. *L. inundatum*.
 - EE. Plant erect or nearly so, roughly tree-like in its form. 8. *L. obscurum*.

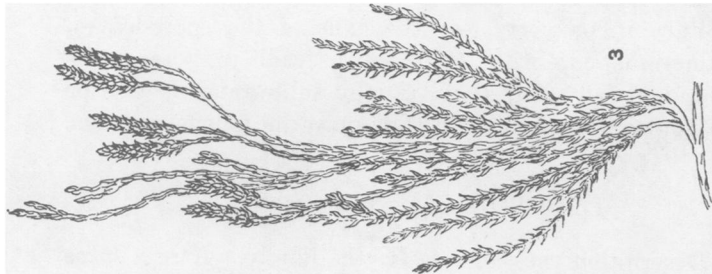
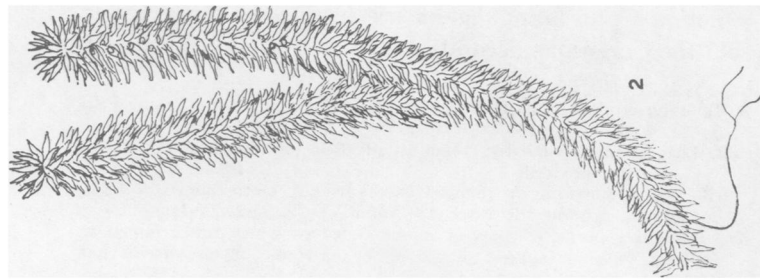
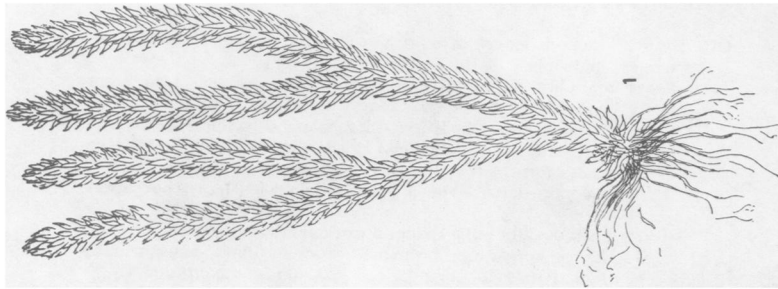


PLATE NO. 1.

Fig. 1, *Lycopodium selago*, X $\frac{1}{2}$; fig. 2, *Lycopodium lucidulum*, X $\frac{1}{2}$;

fig. 3, *Lycopodium sitchense*, X $\frac{1}{2}$. (68)

1. LYCOPODIUM SELAGO L. (Plate 1, Fig. 1.)

Fir Club-moss.

Stems 3-8 in. high, thick, rigid, erect, 2-5 times forked, the branches forming a level-topped cluster. Leaves crowded, all alike, ascending, linear to acuminate, entire, the upper mostly 8-ranked and sterile, those below bearing the small sporangia in their axils, those of lower half of the stem again sterile. Plant propagated also by bud-like organs which have a lower pointed bract and two or three fleshy and obovate ones.—On rocks. Alaska to Labrador; south to Washington, Michigan and Carolina; Europe; Asia.

2. LYCOPODIUM LUCIDULUM Michx. (Plate 1, Fig. 2.)

Shining Club-moss.

Old stems covered by debris, forked into branches which again fork every one to several years. Leaves dense, widely spreading or reflexed, dark green, shining, lanceolate, acute, minutely toothed, all alike. Sporangia in axils of leaves near stem-tip, often persisting for several years, kidney-shaped. Plant often also reproduced by gemmae or buds.—British Columbia and New Brunswick, south to Washington, Iowa and North Carolina.

3. LYCOPODIUM COMPLANATUM L. (Plate 2, Fig. 1.)

Ground Pine.

Stems creeping on or below the surface; branches erect, fan-shaped, 4-12 in. high, several-forked above; branchlets crowded, flattened. Leaves minute, imbricate to appressed, 4-ranked, lateral rows with somewhat spreading tips, upper row closely appressed, lower row short and pointed. Cones 2-4 in a cluster, on a long slender pedicel arising from end of a branch. Spore-leaves broadly ovate, acuminate, their margin pale and irregular. Sporangia transversely oval, deeply splitting.—Alaska to

Labrador, south to Washington, the Great Lakes and Virginia.

4. *LYCOPodium SITCHENSE* Rupr. (Plate 1, Fig. 3.)

Tufted Club-moss.

Stems prostrate, 8-24 in. long, beneath or on surface of ground, much-branched; branches tufted, consisting of compact masses of vertical terete branchlets; tufts 1-5 in. high with occasional stronger fertile branchlets higher than the sterile. Leaves lanceolate, with wide base, spreading, curving upward, thick, entire, acute, on the branchlets 5-ranked. Cones $\frac{1}{2}$ - $\frac{3}{4}$ in. long, sessile or on sparsely-leaved slender pedicels which sometimes branch and thus bear more than one cone. Spore-leaves broadly ovate, acuminate.—British Columbia to Labrador, south to Oregon and New York.

5. *LYCOPodium CLAVATUM* L. (Plate 2, Fig. 3.)

Running Pine.

Stems creeping, 1-10 ft. long, with similar branches, decumbent or ascending, 3-8 in. high; leaves crowded, many-ranked, incurved, linear to subulate, bristle-tipped, lower denticulate, upper entire. Cones 1-4 in a cluster, on a long pedicel, $\frac{3}{4}$ -2 $\frac{1}{2}$ in. long. Spore-leaves membranous, ovate, awn-tipped, bearing oval sporangia which split nearly to base.—Alaska to Labrador, south to Washington, Michigan and North Carolina.—The spores are sold under the drug name of *Lycopodium*. It relieves a chapped skin by its smoothness, and is also used internally in dyspepsia and bronchial troubles.

6. *LYCOPodium ANNOTINUM* L. (Plate 3, Fig. 1.)

Stiff Club-moss.

Stems prostrate, branched, stiff, slender, 1-4 ft. long; branches similar, ascending, 5-10 in. high, sometimes

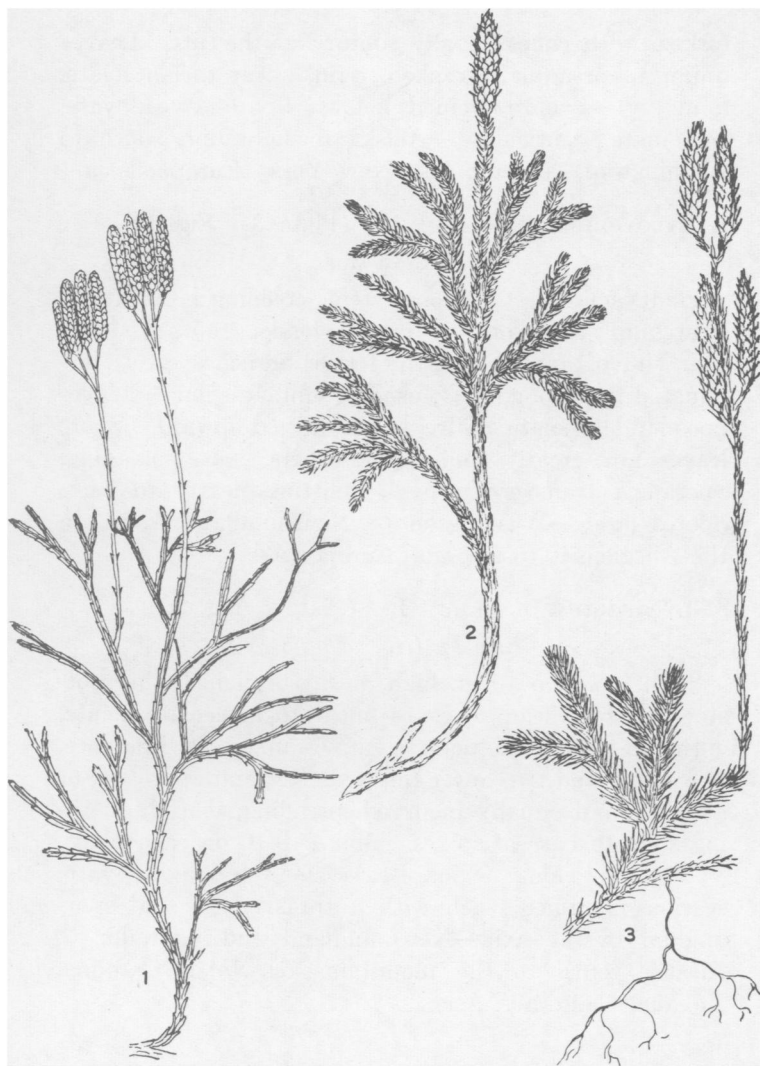


PLATE No. 2.

Fig. 1, *Lycopodium complanatum*, $\times \frac{1}{2}$; fig. 2, *Lycopodium obscurum*, $\times \frac{1}{2}$; fig. 3, *Lycopodium clavatum*, $\times \frac{1}{2}$.

forked, with cones usually solitary at the tips. Leaves uniform, spreading, 5-ranked, rigid, linear to lanceolate, minutely serrulate, veined below. Spore-leaves ovate, acuminate, denticulate.—Alaska to Labrador, south to Washington, Colorado and New York; Europe; Asia.

7. *LYCOPodium inundatum* L. (Plate 3, Fig. 2.)

Bog Club-moss.

Plants small, 1–6 in. long; stems creeping horizontally or arching, simple or 1–2-forked, slender; roots produced near end of annual growth; fertile branches erect, terminated by a long thick, usually solitary spike. Leaves linear to lanceolate, entire, acute, curved upward. Spore leaves not greatly unlike the others, soft, spreading. Sporangia transversely oval, splitting nearly to base. Spores large.—Washington to Newfoundland, south in the Alleghenies to Georgia; Europe; Asia.

8. *LYCOPodium obscurum* L. (Plate 2, Fig. 2.)

Bushy Ground-pine.

Stems erect, 5–10 in. high, bushy-branched, the root-stock subterranean. Leaves linear to lanceolate, acute, entire, 8-ranked on main stem, 6-ranked on branches, two upper and two lower ranks shorter and appressed or all alike and equally incurved-spreading, densely clothing stem to base of spikes. Spikes 1–10 on each plant, $\frac{1}{2}$ – $1\frac{1}{2}$ in. long. Spore-leaves many-ranked, ovate, scarious-margined, each with a transversely oval sporangium in the axil.—Newfoundland and Labrador to Alaska, south to the mountains of North Carolina, Indiana, California; Asia.

SELAGINELLACEAE. *Moss-fern Family.*

Plant moss-like, leafy, much like the Club-mosses except smaller, terrestrial, either prostrate or erect,

branched. Leaves minute, very abundant throughout. Spore-leaves near the tips of the branches, in some like the foliage leaves, in others different and forming a small terminal cone. Sporangia solitary on the spore-leaves near their axils, of two kinds; microsporangia nearest the branch-tip, containing many microspores; megasporangia farther back, normally containing 4 large megaspores. Thallus not projecting out of the spores. There is only the following genus.

SELAGINELLA. MOSS-FERN.

Description the same as for the family. (Diminutive of *Selago*, an old name of *Lycopodium*; the plants resemble small *Lycopodiums*.)

- A. Foliage leaves of two sizes, in two planes, the lateral ones much larger than those of the upper plane. 1. *S. Douglasii*.
- AA. Foliage leaves all alike in size.
 - B. Stems slender, pendent, often very long; leaves not crowded, spreading when wet. 2. *S. struthioloides*.
 - BB. Stems not slender, rigid; leaves crowded, rather appressed even when wet.
 - C. Stems 4-12 in. long; leaves less crowded, about 8-ranked; sterile branches less crowded; stems prostrate, not densely tufted. 3. *S. rupestris*.
 - CC. Stems 2-5 in. long, leaves much crowded, many-ranked; sterile branches crowded, incurved; stems densely tufted. 3a. *S. rupestris densa*.

1. SELAGINELLA DOUGLASII (Hook.) Spring. (Plate 3, Fig. 6).

Stems creeping, rooted at intervals, 3-12 in. long; branches alternate, at nearly right angles to the stem, 2-6 in. long, branched again two or three times. Leaves of the stem in two planes; lateral ones $\frac{1}{2}$ in. long, oval, obtuse, faintly veined; leaves of upper plane one-half as long, oval, incurved, ending in a short point. Spore-leaves in distinct four-sided cones, closely appressed to

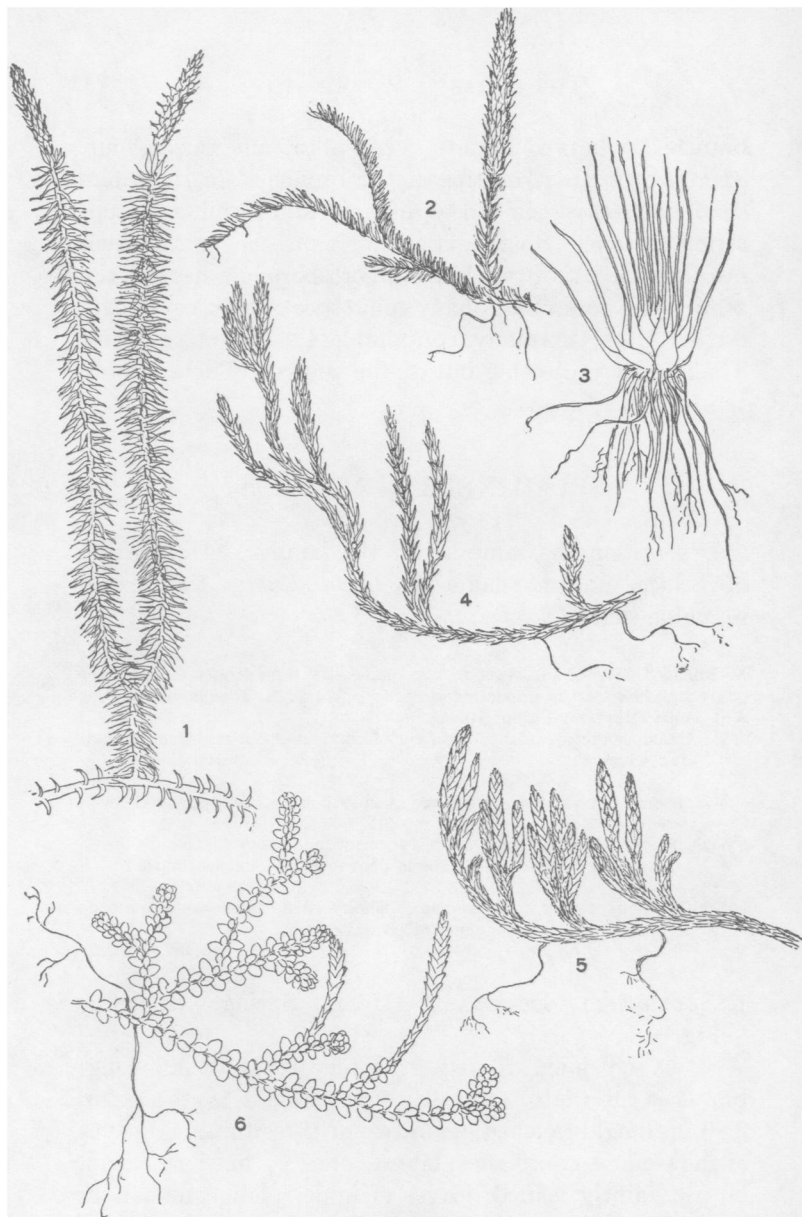


PLATE No. 3.

Fig. 1, *Lycopodium annotinum*, $\times \frac{1}{2}$; fig. 2, *Lycopodium inundatum*, $\times \frac{1}{2}$; fig. 3, *Isoetes Piperi*, $\times \frac{1}{2}$; fig. 4, *Selaginella struthioloides*, $\times 1$; fig. 5, *Selaginella rupestris*, $\times 1$; fig. 6, *Selaginella Douglasii*, $\times 1$.

stem until maturity; cones $\frac{3}{8}$ – $\frac{2}{3}$ in. long, on the tips of the branches.—British Columbia to California.

2. *SELAGINELLA STRUTHIOLOIDES* (Presl.) Underw. (Plate 3, Fig. 4).

Stems 1–6 ft. long, $1\frac{1}{8}$ in. in diameter, pendent, growing with mosses on the trunks of trees, attached by roots from their stems and branches; stems pinnately much branched, light brown. Leaves narrow, $\frac{1}{2}$ in. long, short, white-awned at apex, with occasional cilia on margin, some early losing their awns; leaves on younger branches dark green, loosely spreading; those on old branches light brown, fewer, half appressed; cones or fruiting spikes slender, 4-angled, not abundant.—Near the sea coast. British Columbia to Oregon.

3. *SELAGINELLA RUPESTRIS* (L.) Spring. (Plate 3, Fig. 5.)

Stems prostrate, 4–12 in. long, much branched; branches several times forked, usually less than 3 inches high. Leaves in about 8 ranks, closely appressed except at tips, usually less than $\frac{1}{8}$ in. long, ending in a slender white bristle $\frac{1}{2}$ – $\frac{1}{3}$ as long as the leaf itself; leaves narrow, with deep groove on back, tapering from base to a rounded apex, margins with numerous cilia. Fertile spikes or cones erect, 4-sided, $\frac{1}{4}$ –1 in. long; bracts broader at base than leaves, with shorter and sharper terminal awn, margin more ciliate. Megaspores and microspores borne in same leaf-axils. Megaspores bright orange in color.—British Columbia to New England, south to California and Georgia.

3a. *Selaginella rupestris densa* (Rydb.) Comb. Nov.
(*Selaginella densa* Rydb.)

Stems densely tufted, 2–5 in. long; sterile branches very short, crowded. Leaves many-ranked.—Washington to Montana and Nebraska.

ISOETACEAE. *Quillwort Family.*

Plant consists of a tuft of short hollow cylindrical grass-like pointed leaves with sporangia near their axils; stem short, tuber-like, 2-3-lobed; roots a dense tuft. Leaves spirally arranged but very close. Sporangia large, orbicular or ovoid, plano-convex, thin, sessile, more or less covered by the leaf. Megaspores in the sporangia of the outer leaves, large, globular; microspores in the sporangia of the inner leaves, minute, powdery, grayish, obliquely oblong and triangular. Plants submerged or in swampy places. There is only the following genus.

ISOETES. QUILLWORT.

Description the same as for the family. (Greek *isos* = equal, *etos* = the year; because they are evergreen.) Some species are grown as house plants, since they do well in aquaria.

- A. Cross-section of leaves with four peripheral bast bundles.
 - B. Leaves 1-2 in. long; megaspores covered with short blunt spinules.
 - 1. *I. minima*.
 - BB. Leaves 2-8 in. long; megaspores covered with ridges or crests.
 - 2. *I. Howellii*.
- AA. Cross-section of leaves with 3 peripheral bast bundles; megaspores covered with irregular warts.
 - 3. *I. Nuttallii*.
- AAA. Cross-section of leaves without peripheral bast bundles.
 - C. Plants quite submerged the year round.
 - D. Megaspores with irregular ridges.
 - 4. *I. paupercula*.
 - DD. Megaspores with distinct, low warts.
 - 5. *I. Piperi*.
 - DDD. Megaspores with minute dots which rarely join to form wrinkles.
 - 6. *I. Bolanderi*.
 - CC. Plants only partly submerged or else submerged only part of the year.
 - E. Megaspores covered with broad spinules which are often forked or toothed or sometimes confluent; leaves slender.
 - 7a. *I. echinospora Braunii*.
 - EE. Megaspores covered with few short, wart-like spines; leaves stout.
 - 7b. *I. echinospora Flettii*.

1. ISOETES MINIMA Eat.

Plant terrestrial, in damp soil. Leaves 6-12, 1-2 in.

long, slender, bast-bundles 4, stomates present. Megaspores .290-.350 mm. in diameter, covered with short blunt slender spinules, the equator also beset with these points. Microspores papillose or sparingly spinulose, white, .026-.031 mm. long. The smallest American species.—Washington (Spokane County).

2. *ISOETES HOWELLII* Engelm.

Plant submerged in winter, in summer often only partly so; leaves 6-50, 2-8 in. long, with numerous stomates and 4 bast bundles. Megaspores .250-.500 mm. in diameter, dark gray or black, covered with low blunt isolated or confluent crests. Microspores .020-.030 mm. long, light brown, covered with low blunt tubercles or spines.—Washington to California and Idaho.

3. *ISOETES NUTTALLII* A. Br.

Plant terrestrial, growing in wet places. Leaves 2-9 in. long, with 3 peripheral bast bundles. Sporangia covered by indusia. Megaspores small, .250-.500 mm. in diameter, white or light gray, of glassy lustre, marked by small regular warts. Microspores papillose, brown, .025-.028 mm. long.—California to British Columbia and Idaho.

4. *ISOETES PAUPERCULA* (Engelm.) Eat.

Plant submerged. Leaves 5-20, 2-5 in. long, thin, without stomates, peripheral bast-bundles wanting. Megaspores with irregular ridges. Microspores .026-.036 mm. long, granulate.—Washington to California and Colorado.

5. *ISOETES PIPERI* Eat. (Plate 3, Fig. 3.)

Plant submerged. Stomates none. Megaspores with low, distinct warts.—Washington.

6. *ISOETES BOLANDERI* Engelm.

Plant submerged. Leaves 5-25, erect, soft, bright green, tapering to a fine point, thin-walled, with few

stomates, 2-5 in. long. Sporangia broadly oblong, mostly not spotted, with a narrow indusium. Megaspores .300-.450 mm. in diameter, marked with minute dots which rarely join to form wrinkles. Microspores deep brown, .026-.031 mm. long, spinulose or rarely smooth.—Washington and Idaho to California, Colorado and Utah.

7a. ISOETES ECHINOSPORA BRAUNII (Durieu) Engelm.

Braun's Quillwort.

Plant submerged, or in dry seasons emerged. Leaves 10-30, usually 3-6 in. long, sometimes 10 in. long, without peripheral bast-bundles, half-erect in water, recurved out of water, dark green, occasionally reddish at base, bearing stomates only at tip. Sporangium pale, spotted, half-covered by the indusium. Megaspores .350-.550 mm. in diameter, covered with spinules; spinules wide, often forked or toothed, sometimes recurved, often confluent and incised at tips. Microspores .026-.030 mm. in length, white or gray, smooth, numerous.—Alaska to Labrador and Greenland, south to Pennsylvania, Utah, Washington.

7b. ISOETES ECHINOSPORA FLETTII Eat.

Differs from var. *Braunii* in having stout leaves; spines of megaspores few, short, wart-like; microspores also spinulose.—Washington and British Columbia.

EQUISETACEAE. HORSE-TAIL FAMILY.

Plants rush-like, growing in wet places or in sand, often branched; stems jointed, usually hollow, arising from subterranean rootstocks; the sterile and fertile often unlike, the epidermis containing silica. Sterile leaves reduced to sheaths at joints; fertile leaves forming a cone-like spike terminating the stem. Sporangia clustered beneath the cone scales, each with 1 spore-hollow.

Spores all of the same size and shape, furnished with two narrow appendages (elaters); elaters strap-like, attached at their middle, coiled around the spore, spreading when mature and dry. Thalli on surface of ground, green. usually dioecious. There is only the following genus.

EQUISETUM. HORSE-TAIL.

Description the same as for the family. (Latin *equus* = horse; *seta* = a bristle or hair; because the much-branched ones suggest a horse's tail.) *E. arvense* and *E. telmateia* were formerly used for polishing kitchen ware. When very abundant in hay the horse-tails are said to be injurious to cattle.

- A. Aerial stems annual, branched; spike not tipped with a rigid point.
- B. Stems of two kinds; the sterile one much branched, green; the fertile one unbranched, short lived, whitish or yellowish, not green.
- C. Sterile stems slender, less than 2 ft. high, 6-9-furrowed; branchlets sharply 3-4-angled.
 - 1. *E. arvense*.
- CC. Sterile stems stout, more than 2 ft. high, 20-40-furrowed; branchlets more than 4-ridged but terete.
 - 2. *E. telmateia*.
- BB. Stems all alike, branched, green.
 - D. Stems 5-9-furrowed, 10-20 in. high; leaf-sheaths of stem about 8-toothed.
 - 3. *E. palustre*.
 - DD. Stems many-furrowed, 2-3 ft. high; leaf-sheaths of stem many-toothed.
 - 4. *E. fluviale*.
- AA. Aerial stems perennial, little or not at all branched; spike tipped with a rigid point.
 - E. Stems small, tufted, slender, 3-10-furrowed.
 - F. Leaf-sheaths 3-toothed; stem solid, flexible.
 - 5. *E. scirpoides*.
 - FF. Leaf-sheaths 5-10-toothed; stem hollow, not very flexible.
 - 6. *E. variegatum*.
 - EE. Stems large, stout, many-furrowed.
 - G. Stem smooth; sheath having 1 black girdle at base of teeth.
 - 7. *E. lacvigatum*.
 - GG. Stem rough; sheath having 2 black girdles.
 - 8. *E. hyemale*.

1. EQUISETUM ARVENSE L. (Plate 4, Figs. 8, 9, 10.)

Field Horse-tail.

Stems above ground are annual, of two kinds. Sterile

stems green, slender; 4-24 in. high, 6-19-furrowed, with many whorls of branches; branches long, jointed, 3-4 angled, solid, their sheaths 4-toothed, stomates in two rows in each furrow; central stem hollow $\frac{1}{5}$ - $\frac{1}{3}$ the diameter of the stem. Fertile stems appearing very early, before the sterile, 4-12 in. high, unbranched, of short duration, light brown; their sheaths whitish, ending in about 12 acuminate teeth.—In sandy soil specially along railroad embankments, in meadows and in cultivated fields. Alaska to Greenland, south to California and New England; Europe; Asia.

2. *EQUISETUM TELMATEIA* Ehrh. (Plate 4, Figs. 5, 6.)

Giant Horse-tail.

Stems above ground are annual, of two kinds. Sterile stems ivory-white or greenish, stout, 2-8 ft. high, 20-40-furrowed; their branches very numerous, erect to spreading, simple, 4-5-angled, the ridges rough and sulcate, the lower joint shorter than the leaf-sheath of the stem. Fertile stems 10-15 in. high, short-lived, white, many-furrowed; leaf-sheaths loose, brownish, elongated, deeply 20-30-toothed.—In all kinds of soil, much in swamps and on railroad embankments. British Columbia to California; Europe.

3. *EQUISETUM PALUSTRE* L. (Plate 4, Fig. 11.)

Marsh Horse-tail.

Stems above ground are annual, branched, slender, all alike, 10-20 in. high, deeply 5-9-furrowed; the furrows separated by narrow, wing-like, roughish ridges; stem-sheaths loose, toothed; their teeth about 8, lance- to awl-shaped, whitish, marginal; branches few, in a whorl, simple, 4-7-angled, hollow; branch-sheaths mostly 5-toothed.—Alaska to Nova Scotia, south to Washington and New York; Europe.

4. *EQUISETUM FLUVIATILE* L. (Plate 4, Fig. 7.)*Water Horse-tail.*

Rootstocks hollow; stems above ground annual, 2-3 ft. high, slightly many-furrowed, smooth, usually producing upright branches after fructification; air-cavities wanting under grooves, small under ridges; central hollow very large; stem-sheaths appressed, toothed; their teeth about 18, dark brown, short, acute, rigid; branches hollow, slender, smaller but otherwise like stems, short or elongated.—Alaska to Labrador, south to Washington and Virginia; Europe; Asia.

5. *EQUISETUM SCIRPOIDES* Michx. (Plate 4, Fig. 4.)*Dwarf Scouring-rush.*

Stems perennial, evergreen, very slender or filiform, 3-6 in. high, somewhat rough, flexuous and curving, tufted, mostly 6-furrowed with the ridges acute, simple or branched from near base; central hollow wanting; stem-sheath 3-toothed, the bristle-like tips rather persistent.—Alaska to Labrador, south to Washington, Illinois and Pennsylvania.

6. *EQUISETUM VARIEGATUM* Schl. (Plate 4, Fig. 1.)*Variegated Scouring-rush.*

Stems perennial, evergreen, slender, tufted, 5-10-furrowed, 6-20 in. long, simple; central hollow small; stem-sheath green, variegated with black above, edged with white, 5-10-toothed, tipped with deciduous bristles. Spore-leaves very small, tipped with a comparatively large point.—Arctic America, south to Nevada and Pennsylvania.

7. *EQUISETUM LAEVIGATUM* A. Br. (Plate 4, Figs. 2, 3.)*Smooth Scouring-rush.*

Stems 1-5 ft. high, simple or little branched, pale

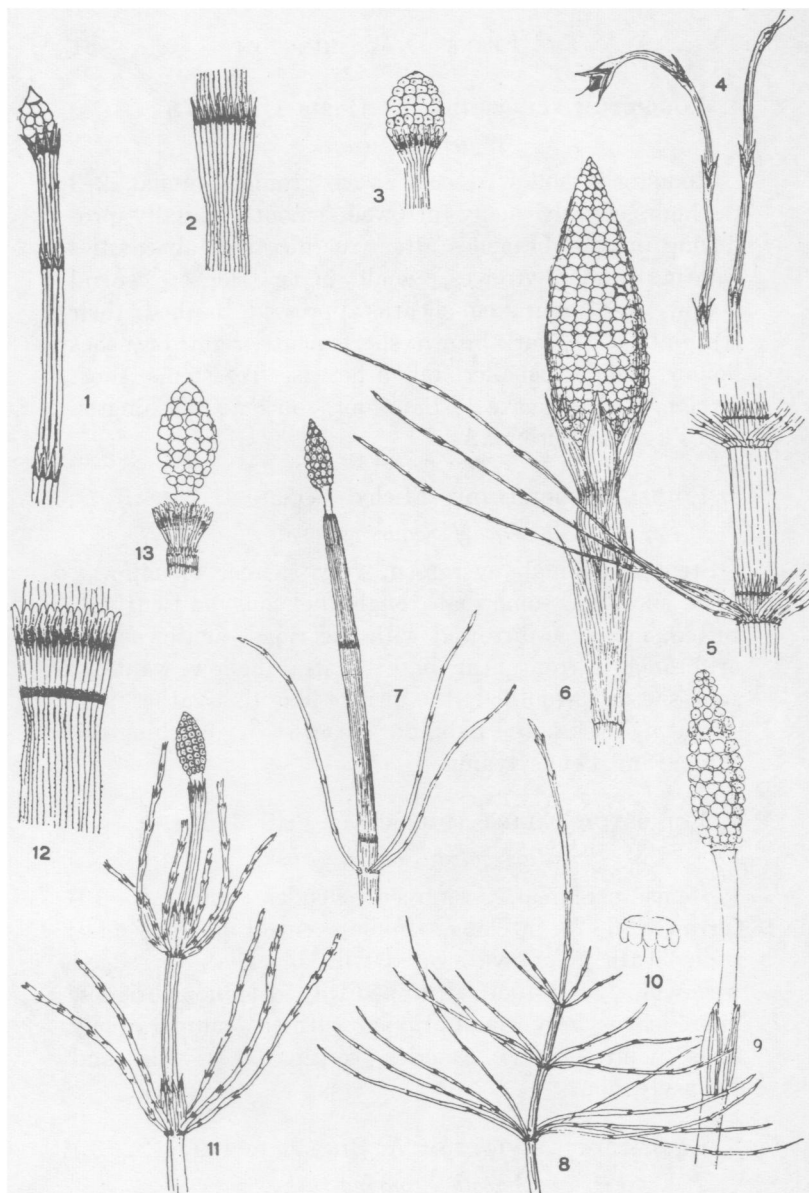


PLATE NO. 4.
Equisetum (Figs. 1-13; explanation on p. 83).
 (82)

green, 14–30-furrowed and the ridges almost smooth; central hollow very large, stem-wall very thin; sheath elongated, slightly enlarged upward, marked with a black girdle at the base of the teeth; teeth mostly deciduous, white, marginal.—British Columbia to New York, south to California, Texas and Georgia.

8. *EQUISETUM HYEMALE* L. (Plate 4, Figs. 12, 13.)

Common Scouring-rush.

Stems slender, rather stiff, evergreen, 2–4 ft. high, rough, 8–34-furrowed, seldom branching; central hollow large, $\frac{1}{2}$ – $\frac{2}{3}$ the stem diameter; sheaths marked with two black girdles; teeth brown, membranous, soon deciduous. Spikes pointed.—British Columbia to New England, south to California and Georgia; Europe; Asia.—Formerly used for scouring floors.

EXPLANATION OF PLATE 4.

Fig. 1, *Equisetum variegatum*, cone and stem-tip, $\times 1$; fig. 2, 3, *Equisetum laevigatum*; fig. 2, joint of stem with bract-leaves; fig. 3, cone, $\times 1$; fig. 4, *Equisetum scirpoides*, the left stem with bud-like terminal cone, the right stem sterile, $\times 1\frac{1}{2}$; fig. 5, 6, *Equisetum telmateia*; fig. 5, a few joints of the green vegetative stem; fig. 6, the top of the whitish, fertile stem with large bract-like leaves and cone, $\times \frac{1}{2}$; fig. 7, *Equisetum fluviatile*, upper portion of stem, and cone, $\times \frac{1}{2}$; fig. 8, 9, 10, *Equisetum arvense*; fig. 8, the upper part of the green vegetative stem; fig. 9, the top of the whitish fertile stem with large bracts and cone, $\times \frac{1}{2}$; fig. 10, the side view of a sporophyll, $\times 2\frac{1}{2}$. fig. 11, *Equisetum palustre*, upper portion of plant and cone, $\times \frac{1}{2}$; figs. 12, 13, *Equisetum hyemale*; fig. 12, a joint of the stem with bract leaves; fig. 13, a cone, $\times 1$.

A New Hybrid Fern.

F. C. GREENE

***Polystichum acrostichoides* \times *Dryopteris cristata* hyb. nov.**

In general appearance the hybrid closely resembles *Polystichum acrostichoides*. The fronds are dark green above and paler beneath. The fertile fronds have contracted pinnæ in the upper spore-bearing portion as in